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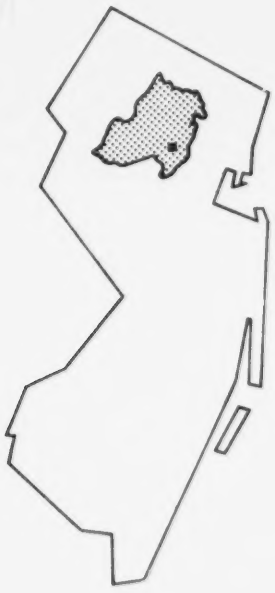
FLOOD INSURANCE STUDY



BOROUGH OF MORRIS PLAINS, NEW JERSEY
MORRIS COUNTY

DECEMBER 1, 1980

federal emergency management agency
federal insurance administration

COMMUNITY NUMBER - 340351

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Exhibit 2 - Flood Boundary and Floodway Map

PUBLISHED SEPARATELY:

Flood Insurance Rate Map

1.0 INTRODUCTION

1.1 Purpose of Study

The purpose of this Flood Insurance Study is to investigate the existence and severity of flood hazards in the Borough of Morris Plains, Morris County, New Jersey, and to aid in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. Initial use of this information will be to convert Morris Plains to the regular program of flood insurance by the Federal Insurance Administration. Further use of the information will be made by local and regional planners in their efforts to promote sound land use and flood plain development.

1.2 Coordination

An initial meeting was held on May 19, 1976, and was attended by representatives of the Federal Insurance Administration, the study contractor, and borough officials. At this meeting, those streams to be studied by detailed and approximate methods were identified.

Throughout the study, the borough officials and the office of the Morris County Engineer provided information.

A final coordination meeting was held on December 7, 1978, to review the results of the study. It was attended by representatives of the Federal Insurance Administration, the study contractor, and the community. No significant changes resulted from this meeting.

1.3 Authority and Acknowledgments

The source of authority for this Flood Insurance Study is the National Flood Insurance Act of 1968, as amended.

The hydrologic and hydraulic analyses for this study were performed by the New Jersey Department of Environmental Protection, for the Federal Insurance Administration, under Contract No. H-3959. This work, which was completed in September 1978, covered all significant flooding sources affecting the Borough of Morris Plains.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated areas of the Borough of Morris Plains, Morris County, New Jersey. The area of study is shown on the Vicinity Map (Figure 1).

Flooding from Watnong and Jaquis Brooks within the corporate limits was studied by detailed methods.

Flooding sources that were studied by approximate methods are Malapardis Brook and its tributary, as well as an unnamed tributary to Watnong Brook within the corporate limits.

Approximate analyses were used to study those areas having a low development potential or minimal flood hazards.

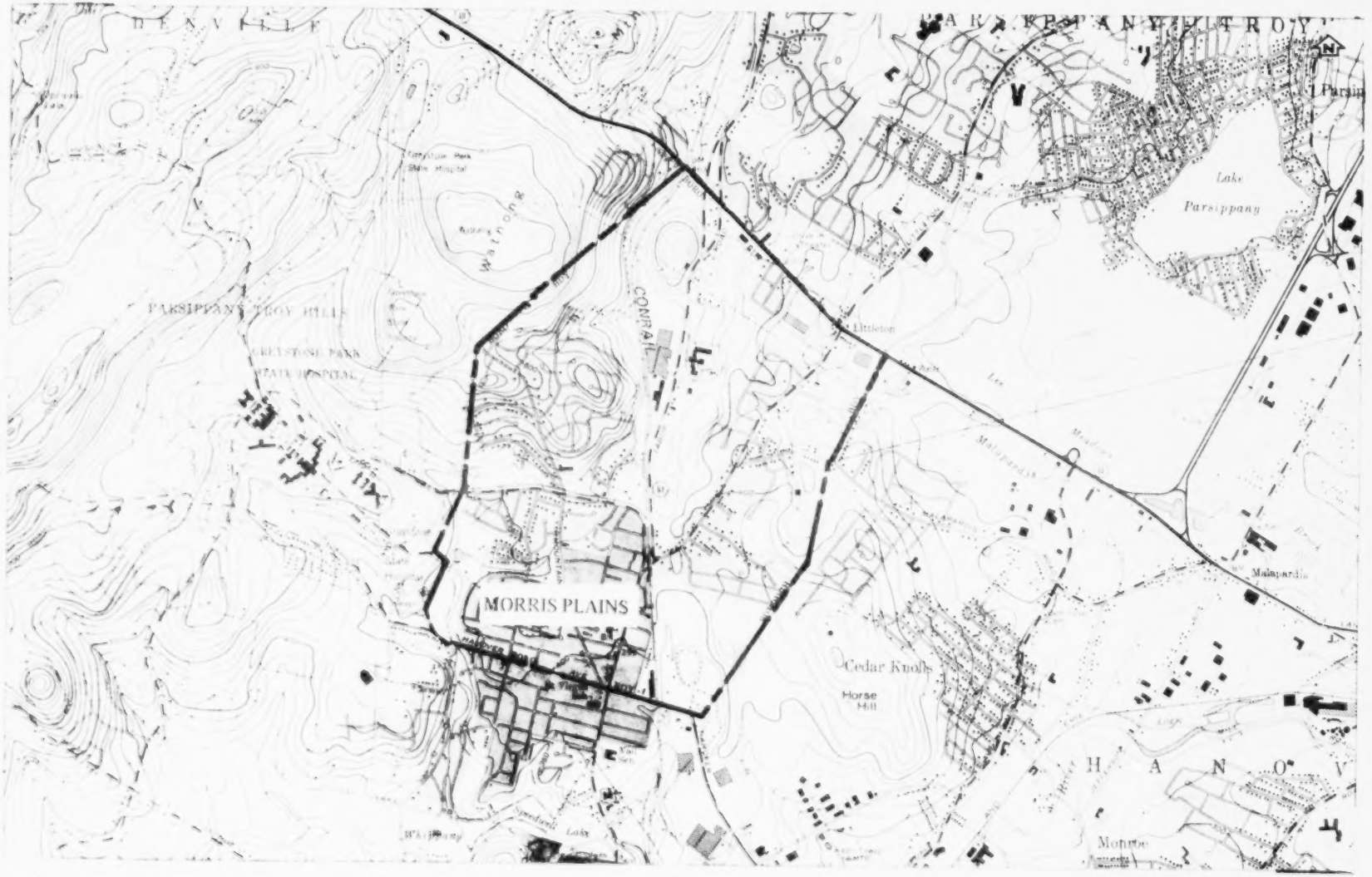
Those areas studied by detailed methods were chosen with consideration given to all proposed construction and forecasted development through 1983.

2.2 Community Description

Morris Plains is in east-central Morris County, in northeastern New Jersey. It is approximately 25 miles west of the City of New York. The borough encompasses an area of approximately 2.61 square miles, and is bordered by the Township of Morris on the south, the Township of Parsippany-Troy Hills on the west and north, and the Township of Hanover on the east.

Transportation access to Morris Plains is available by way of Interstate Highways 80, 280, and 287. The local highway system includes, State Highways 53, 202, and 10. The New Jersey Department of Transportation has proposed State Highway 78 as a bypass for the area to alleviate congestion, and has acquired a portion of the right-of-way required. Conrail provides rail commutation service into the New York metropolitan area. Express bus service is also available.

The earliest known inhabitants of the Morristown area, of which Morris Plains is a part, were the Lenni-Lenape Indians. White settlers were attracted to the area in the early 1700s by the large number of furbearing animals, the presence of iron ore, and the water power potential of nearby Whippany River. Forges, mills, and farms sprang up in the area as land was acquired from the Indians. Morris Plains, then known as Watnong Plains, was included as part of the Township of Hanover when Morris County was divided into three townships in 1740. The area gained fame when George Washington chose it as a strategic location for his headquarters during the Revolutionary War. His selection was influenced by its convenient access to New England and the southern colonies, the availability of ammunition from Fords powder mill,



FIGURE

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

BOROUGH OF MORRIS PLAINS, NEW JERSEY

APPROXIMATE SCALE

2200 0 2700 5400 8100 FEET

and the loyalty of the local citizens to the Revolutionary cause. During the 19th century, the Morristown area, with its large estates, became known as a resort area. The depression led to a breakup of these large estates. This event, coupled with the advent of improved transportation, resulted in an increase in population and the development of Morris Plains. The village of Morris Plains included sections of both Morris and Hanover Townships until 1926, when it was incorporated as a separate borough. At that time, it elected to remain in the Township of Morris. Morris Plains is a residential community with approximately two-thirds of its land developed.

Population, according to the 1970 census, was 5540. It has since increased to an estimated 5650. Population for 1985 is estimated to reach 6500 according to the 1975 Master Plan for Morris Plains (Reference 1).

Residential use continues to represent just over one-third of the development in the community. Growth is primarily the single-family residential category.

Industrial and laboratory activities have been expanded by the addition of the IBM facilities on State Highway 10 at Johnson Road. This is a direct result of the 1967 Master Plan which recommended this area be changed to a laboratory zone. This change was later implemented by a zoning ordinance amendment.

Warner-Lambert has since acquired land south of their original holdings between State Highway 53 and the State Highway 78 alinement, which clears the way for their expansion in that direction.

More recently, subdivision and site plans have been approved for Litton Industries to develop their lands off Hanover Avenue. Company plans call for the immediate construction of a new facility to house their Monroe Calculator Division. Completion of road access and utilities will encourage development of their remaining land.

One significant change in the public and semipublic category of land use is the addition of the REM Country Day School on Littleton Road. This is a semipublic facility offering day care and elementary educational instruction. Another important change is in the category of streets and rights-of-way. The new residential growth has resulted in additional areas devoted to local service streets. Acquisitions by the New Jersey Department of Transportation for the new State Highway 78 right-of-way has resulted in a substantial increase in this category. It should be pointed out that this represents only that land which they have actually acquired from Littleton Road south to Hanover Avenue. The alinement preservations shown from Littleton Road north to State Highway 10 indicate that there will be substantially more area acquired for this route.

Correspondingly, residential development may be expected to decl somewhat as a percentage of total development in the future.

The flood plains of Watnong Brook, Jaquis Brook, and Malapardis Brook are occupied by residential, industrial, and laboratory buildings; parkland; and undeveloped land.

The topography of Morris Plains is characterized by hilly terrai in the northwestern portion while relatively level areas lie to the south of Grannis Avenue and east of Littleton Road. The hig elevations occur east and west of Grove Avenue, north of its int section with Mountain Way. The elevations range from 830 feet to 330 feet in the northeastern area. Another substantial hill is situated east of Conrail and adjacent to State Highway 53 nea the Easter Seal center. This latter ridge extends as far south as Grannis Avenue along the eastern side of State Highway 53. Recent soil removal operations, however, have cut this ridge bac to a point just south of the Warner-Lambert property.

A study prepared by Rutgers University has grouped the soils in Morris Plains into the following four categories (Reference 2).

The higher areas of Morris Plains to the northwest are identifie as gneissic bedrock. Soil cover varies greatly in this area whe bedrock is 2 feet deep in some locations, and as much as 20 feet deep in the same vicinity. The soil itself is silty clay and silty sand, usually containing considerable rock fragments. Are surface-drainage characteristics are generally good because of the high elevations and sloping ground surfaces. Subsurface dra however, is impeded by the shallow rock formations.

The southwestern portion of Morris Plains, from Grannis Avenue south, is identified as glacial outwash. It was deposited by glacial melt waters during the Wisconsin Glaciation. Soils are silty sand with some gravel and they have resultant good interna drainage. Surface drainage may present problems at some locatio due to the flatness of the land.

The remainder of the borough, generally to the east of Conrail, is classified as glacial terminal moraine. The moraine is compo of materials deposited at the outer edge of the ice sheet during the Wisconsin Glaciation. Soil and drainage characteristics are similar to those found in the glacial outwash with the addition of some appreciable amounts of clay.

Finally, along Watnong Brook, which is a major drainage course, the soils are classified as recent alluvium deposits consisting of sand and gravel carried by the stream.

Morris Plains is divided into three separate surface-drainage areas. The most prominent and best defined drainage course is

Watnong Brook, a tributary of Whippany River, which drains the western portion of Morris Plains. The brook enters the borough at the northwestern corporate limits near U.S. Highway 10, and flows southerly to the vicinity of Grannis Avenue. From there, Watnong Brook flows generally southwesterly through Jaquis Pond to the southern corporate limits at Hanover Avenue. The drainage area at the southern corporate limits is 6.4 square miles.

Jaquis Brook is a tributary of Watnong Brook and originates in Parsippany-Troy Hills. It flows generally southeasterly into Morris Plains, in the vicinity of Grannis Avenue. The brook then joins Watnong Brook at Jaquis Pond above Central Avenue. The drainage area of Jaquis Brook at this latter point is 2.1 square miles.

The northeastern section of Morris Plains is served by a second, somewhat well-defined drainage course, that of Malapardis Brook. The brook has one branch originating west of Littleton Road and one branch, in the Community Park south of Malapardis Road; both extend northeast into Parsippany-Troy Hills, just north of Malapardis Road. The remainder of the borough to the southeast, from Old Wood Road south, does not have such a well-defined drainage system. Surface drainage flows generally southerly and westerly into Hanover.

The climate of Morris Plains is characteristic of the mid-eastern Atlantic coast region. The average annual maximum and minimum temperatures recorded at a nearby weather station located in Newark, New Jersey, are 85.5°F and 24.7°F, respectively. The average rainfall is 41.6 inches and the average annual snowfall is 27.8 inches (Reference 3).

The vegetation is urban in nature, primarily comprised of grass and shrubs.

2.3 Principal Flood Problems

The flooding along Watnong Brook and Jaquis Brook is caused by heavy rain, usually associated with localized thunderstorms and hurricanes during the summer and fall months. Less intense rain, falling on frozen ground, has produced lesser floods during winter months.

Area surface-drainage characteristics are generally good due to high elevations and sloping ground surfaces. There are some locations, however, with flat ground where flooding can be a problem.

The major flood in August 1971 caused by a tropical storm named Doria, created considerable overbank flooding along streams, and caused traffic interruptions and property damage.

Problem flooding locations identified at various times include the following:

The area along Watnong Brook at the Warner-Lambert Plant, at the Lutheran Church near Mountain Way, and several houses at Jaquis Pond near Hanover Avenue, have all experienced flooding during severe rainstorms.

The underpass at the junction of State Highways 202 and 53 has often been inundated and frequently closed to traffic in the 1970s.

Johnson Road, between Malapardis Road and the old IBM building, was closed because of a mud slide from the construction site resulting from rains in March 1977.

Flooding from Watnong Brook near Mountain Way, during a rainstorm in March 1977, is shown in Figure 2.

Expected 100- and 500-year flood heights of Watnong Brook, at Grannis Avenue, are illustrated in Figure 3.

2.4 Flood Protection Measures

Although such existing impoundments as Jaquis Pond and other small ponds do help control smaller flood events on Watnong Brook, there are no significant flood control works along borough streams which can control flooding during severe storms.

Recommendations for additional flood protection measures are contain in two previous studies. The first of these, a drainage study for Morris County (Reference 4), includes recommendations for cleaning, improvement, and/or replacement of some bridge and culvert structures in the borough to increase their conveyance capacity during flood events. Implementation of these proposed improvements would not appreciably alter the delineation in this Flood Insurance Study, which concerns itself with floods having return periods in excess of 10 years.

The second study, the Passaic River Report, prepared by the U.S. Army Corps of Engineers, New York District, with supplement (Reference 5), contains suggested measures for flood control by initiating projects which would affect flooding characteristics of Passaic River and its tributaries. However, these projects have not been considered in this study, since implementation of this program is not expected before 1983.

Morris Plains has recognized the need for proper flood management, and the community adopted a resolution (Reference 6) on April 3, 1975 to accomplish this need. The resolution established land use and control measures to reduce future flood losses. It also established regulations which require all new construction or

Figure 2. Flood Overflow From Watnong Brook Adjacent to Mountain Way During a Rainstorm in March 1977

Figure 3. Looking Upstream at Grannis Avenue Bridge Over Watnong Bro
(Expected 100- and 500-Year Flood Elevations Are Illustrate

substantial improvements (including prefabricated and mobile homes) to be reasonably safe from flooding and flood damage, and to have reasonably good water quality.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude which are expected to be equalled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for flood plain management and for flood insurance premium rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10, 2, 1, and 0.2 percent chance, respectively, of being equalled or exceeded during any year. Although the recurrence interval represents the long term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood which equals or exceeds the 100-year flood (1 percent chance of annual occurrence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported here reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for floods of the selected recurrence intervals for each stream studied in detail in the community.

For Watnong and Jaquis Brooks, where gage data were not available and the drainage area was larger than 1 square mile, the 10-, 50-, and 100-year discharges were calculated by using regional relationships contained in Special Report 38, developed by the U.S. Geological Survey, in cooperation with the New Jersey Department of Environmental Protection (Reference 7). This analysis takes into consideration drainage area, main channel slope, surface storage, and manmade impervious land cover. It was developed from a regression analysis of 103 stream-gaging stations throughout New Jersey.

Discharges for the 500-year flood events for these streams were estimated by straightline extrapolation on log-probability paper based on flood discharges computed for flood frequencies of up to 100-years.

Peak discharge-drainage area relationships for Watnong and Jaquis Brooks are shown in Table 1.

Table 1. Summary of Discharges

Flooding Source and Location	Drainage Area (Square Miles)	Peak Discharges (Cubic Feet per Second) 10-Year	50-Year	100-Year	500-Year
Watnong Brook					
At Hanover Avenue	6.35	965	1525	1850	2720
Upstream of Confluence With Jaquis Brook	4.10	680	1090	1330	1970
At the Most Downstream Conrail Crossing	3.80	670	1075	1305	1920
Jaquis Brook					
Upstream of Confluence With Watnong Brook	2.10	170	285	335	560

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of streams in the community were carried out to provide estimates of the elevations of floods of the selected recurrence intervals along each stream studied in the community.

Water-surface elevations for both streams studied by detailed methods were computed using the U.S. Army Corps of Engineers HEC-2 step-backwater computer program (References 8 and 9). The computer models for Watnong Brook and Jaquis Brook were calibrated with the aid of floodmark information obtained during the flood of August 1971. Cross sections for the backwater analyses of Watnong Brook and Jaquis Brook were determined by combining field-surveyed channel and bridge data with overbank topographic data taken from aerial mapping (Reference 10). The field-surveyed sections were located at close intervals upstream and downstream of bridges and culverts in order to compute significant backwater effects of these structures. In addition, cross sections were taken between hydraulic controls wherever warranted by topographic changes.

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles (Exhibit 1). For stream segments for which a floodway is computed (Section 4.2), selected cross section locations are also shown on the Flood Boundary and Floodway Map (Exhibit 2).

Roughness factors (Manning's "n") for these computations were assigned on the basis of a field inspection of channel and overbank areas. The "n" values used ranged from 0.025 to 0.035 for the channel areas and from 0.060 to 0.100 in the overbank areas.

Starting water-surface elevations for Watnong Brook were obtained from flood profiles of Whippany River computed for the Township of Morris (Reference 11). Starting elevations for Jaquis Brook were obtained from flood profiles of Watnong Brook computed for this study.

Due to the extreme meandering nature of streams in the study area, stream distances will not always agree between maps and profiles.

Flood profiles were drawn showing computed water-surface elevations to an accuracy of 0.5 foot for floods of the selected recurrence intervals (Exhibit 1).

The hydraulic analyses for this study were based on the assumption that hydraulic structures, such as bridges and culverts, are unobstructed. The elevations as shown on the profiles are, therefore, considered valid only if hydraulic structures, in general, remain reasonably unobstructed.

The average depths used for the shallow flooding analysis were based on weir computations and field surveys.

For streams studied by approximate methods, the depth-discharge relationship developed by the U.S. Geological Survey (Reference 12) was utilized to determine approximate 100-year flood elevations.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in the study are shown on the maps.

4.0 FLOOD PLAIN MANAGEMENT APPLICATIONS

A prime purpose of the National Flood Insurance Program is to encourage State and local governments to adopt sound flood plain management programs. Each Flood Insurance Study, therefore, includes a flood boundary map designed to assist communities in developing sound flood plain management measures.

4.1 Flood Boundaries

In order to provide a national standard without regional discrimination, the 100-year flood has been adopted by the Federal Insurance Administration as the base flood for purposes of flood plain management measures. The 500-year flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the boundaries of the 100- and 500-year floods have been delineated using the flood elevations determined at each cross section; between cross sections, the boundaries were interpolated using topographic maps at a scale of 1:1200, with a contour interval of 2 feet (Reference 10).

Boundaries for the areas of shallow flooding and approximate flooding were delineated using the same topographic maps (Reference 10) and their respective depths and elevations.

In cases where the 100- and 500-year flood boundaries are close together, only the 100-year flood boundary has been shown.

Small areas within the flood boundaries may lie above the flood elevations and, therefore, not be subject to flooding; owing to limitations of the map scale, such areas are not shown.

4.2 Floodways

Encroachment on flood plains, such as artificial fill, reduces the flood-carrying capacity and increases flood heights, thus increasing flood hazards in areas beyond the encroachment itself. One aspect of flood plain management involves balancing the economic gain from flood plain development against the resulting increase

in flood hazard. For purposes of the National Flood Insurance Program, the concept of a floodway is used as a tool to assist local communities in this aspect of flood plain management. Under this concept, the area of the 100-year flood is divided into a floodway and a floodway fringe. The floodway is the channel of a stream, plus any adjacent flood plain areas, that must be kept free of encroachment in order that the 100-year flood be carried without substantial increases in flood heights. As minimum standards, the Federal Insurance Administration limits such increases in flood heights to 1.0 foot, provided that hazardous velocities are not produced.

As minimum standards, the State of New Jersey limits such increases to 0.2 foot, provided that hazardous velocities are not produced. The floodways in this report are minimum standards that can be adopted or that can be used as a basis for additional studies.

The floodway shown in this study was computed on the basis of equal-conveyance reduction from each side of the flood plain. The floodway at Jaquis Pond is delineated at the shoreline.

The results of these computations are tabulated at selected cross sections for each stream segment for which a floodway is computed (Table 2).

As shown on the Flood Boundary and Floodway Map (Exhibit 2), the floodway boundaries were determined at cross sections; between cross sections, the boundaries were interpolated. In cases where the floodway and 100-year flood boundaries are close together, only the floodway boundary has been shown.

The area between the floodway and the boundary of the 100-year flood is termed the floodway fringe. The floodway fringe thus encompasses the portion of the flood plain that could be completely obstructed without increasing the water-surface elevation of the 100-year flood more than 0.2 foot at any point. Typical relationships between the floodway and the floodway fringe and their significance to flood plain development are shown in Figure 4.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY	WITH FLOODWAY	INCREASE
					(FEET NGVD)			
Watnong Brook								
A	1.000	260	2582	0.7	371.2	371.2	371.2	0.0
B	1.214	470	1329	1.4	371.2	371.2	371.2	0.0
C	1.361	266	542	3.4	373.5	373.5	373.5	0.0
D	1.466	116	760	2.4	380.6	380.6	380.8	0.2
E	1.633	109	247	5.4	383.9	383.9	383.9	0.0
F	1.728	68	172	7.7	387.5	387.5	387.6	0.1
G	1.754	147	385	3.5	389.1	389.1	389.1	0.0
H	2.217	36	168	8.0	401.4	401.4	401.5	0.0
I	2.272	260	891	1.5	404.9	404.9	404.9	0.0
J	2.413	212	361	3.7	406.0	406.0	406.0	0.0
K	2.481	106	233	5.7	409.7	409.7	409.7	0.0
L	2.534	14	90	14.4	412.5	412.5	412.5	0.0
M	3.064	155	218	6.0	422.5	422.5	422.5	0.0
N	3.181	142	560	2.3	426.7	426.7	426.7	0.0
O	3.342	59	146	9.0	430.5	430.5	430.5	0.0
P	3.456	100	629	2.1	439.2	439.2	439.2	0.0
Q	3.692	91	375	3.5	440.2	440.2	440.3	0.1
R	3.815	199	2053	0.6	448.1	448.1	448.1	0.0
Jaquis Brook								
A	0.074	45	134	8.7	381.0	381.0	381.2	0.2
B	0.246	192	288	4.1	390.0	390.0	390.0	0.0

[1]Miles Above Mouth

TABLE 2

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

BOROUGH OF MORRIS PLAINS, NJ
(MORRIS CO.)

FLOODWAY DATA

WATNONG BROOK-JAQUIS BROOK

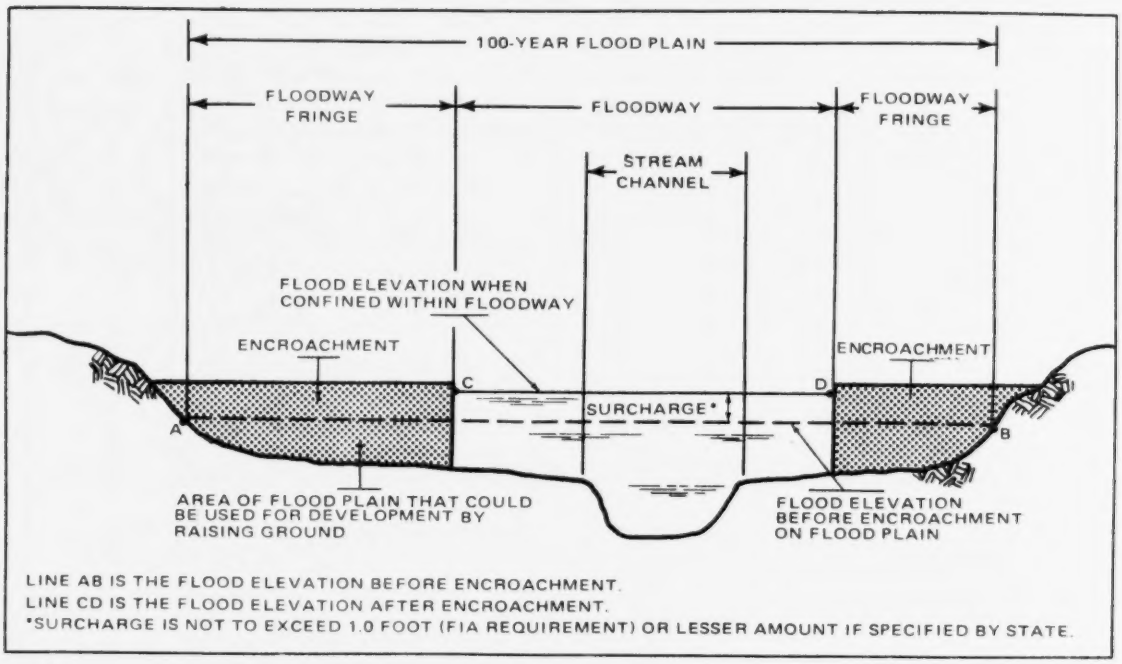

100-YEAR FLOOD PLAIN
FLOODWAY FRINGE
FLOODWAY
FLOODWAY FRINGE
STREAM CHANNEL
FLOOD ELEVATION WHEN CONFINED WITHIN FLOODWAY
ENCROACHMENT
ENCROACHMENT
C
D
SURCHARGE*
A
B
AREA OF FLOOD PLAIN THAT COULD BE USED FOR DEVELOPMENT BY RAISING GROUND
FLOOD ELEVATION BEFORE ENCROACHMENT ON FLOOD PLAIN
LINE AB IS THE FLOOD ELEVATION BEFORE ENCROACHMENT.
LINE CD IS THE FLOOD ELEVATION AFTER ENCROACHMENT.
*SURCHARGE IS NOT TO EXCEED 1.0 FOOT (FIA REQUIREMENT) OR LESSER AMOUNT IF SPECIFIED BY STATE.

Figure 4. Floodway Schematic

5.0 INSURANCE APPLICATION

In order to establish actuarial insurance rates, the Federal Insurance Administration has developed a process to transform the data from the engineering study into flood insurance criteria. This process includes the determination of reaches, Flood Hazard Factors, and flood insurance zone designations for each flooding source studied in detail affecting Morris Plains.

5.1 Reach Determinations

Reaches are defined as lengths of watercourses having relatively the same flood hazard, based on the average weighted difference in water-surface elevations between the 10- and 100-year floods. This difference does not have a variation greater than that indicated in the following table for more than 20 percent of the reach:

Average Difference Between 10- and 100-Year Floods	Variation
Less than 2 feet	0.5 foot
2 to 7 feet	1.0 foot
7.1 to 12 feet	2.0 feet
More than 12 feet	3.0 feet

The locations of the reaches determined for the flooding sources of Morris Plains are shown on the Flood Profiles (Exhibit 1) and summarized in Table 3.

5.2 Flood Hazard Factors

The Flood Hazard Factor (FHF) is the Federal Insurance Administration device used to correlate flood information with insurance rate tables. Correlations between property damage from floods and their FHF are used to set actuarial insurance premium rate tables based on FHFs from 005 to 200.

The FHF for a reach is the average weighted difference between the 10- and 100-year flood water-surface elevations expressed to the nearest one-half foot, and shown as a three-digit code. For example, if the difference between water-surface elevations of the 10- and 100-year floods is 0.7 foot, the FHF is 005; if the difference is 1.4 feet, the FHF is 015; if the difference is 5.0 feet, the FHF is 050. When the difference between the 10- and 100-year water-surface elevations is greater than 10.0 feet, accuracy for the FHF is to the nearest foot.

5.3 Flood Insurance Zones

After the determination of reaches and their respective Flood Hazard Factors, the entire incorporated area of the Borough of Morris Plains was divided into zones, each having a specific flood potential or hazard. Each zone was assigned one of the following flood insurance zone designations:

Zones A3, A4, and A7:	Special Flood Hazard Areas inundated by the 100-year flood, determined by detailed methods; base flood elevations shown, and zones subdivided according to Flood Hazard Factors.
Zone B:	Areas between the Special Flood Hazard Areas and the limits of the 500-year flood, including areas of the 500-year flood plain that are protected from the 100-year flood by dike, levee, or other water control structure; also areas subject to certain types of 100-year shallow flooding where depths are less than 1.0 foot; and areas subje to 100-year flooding from sources with drainage areas less than 1 square mile. Zone B is not subdivided.
Zone C:	Areas of minimal flooding.

FLOODING SOURCE	PANEL[1]	ELEVATION DIFFERENCE[2] BETWEEN 1% (100-YEAR) FLOOD AND			FLOOD HAZARD FACTOR	ZONE	BASE FLOOD ELEVATION (FEET NGVD)[3]
		10% (10-YEAR)	2% (50-YEAR)	0.2% (500-YEAR)			
Watnong Brook							
Reach 1	0001	-1.6	-0.5	1.1	015	A3	Varies - See Map
Reach 2	0001	-2.0	-0.7	0.8	020	A4	Varies - See Map
Reach 3	0001	-3.4	-1.2	3.2	035	A7	Varies - See Map
Jaquis Brook							
Reach 1	0001	-1.6	-0.5	1.1	015	A3	Varies - See Map

[1]Flood Insurance Rate Map Panel [2]Weighted Average [3]Rounded to Nearest Foot

TABLE 3

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

BOROUGH OF MORRIS PLAINS, NJ
(MORRIS CO.)

FLOOD INSURANCE ZONE DATA

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The flood elevation differences, Flood Hazard Factors, flood insurance zones, and base flood elevations for each flooding source studied in detail in the community are summarized in Table 3.

5.4 Flood Insurance Rate Map Description

The Flood Insurance Rate Map for Morris Plains is, for insurance purposes, the principal result of the Flood Insurance Study. This map (published separately) contains the official delineation of flood insurance zones and base flood elevation lines. Base flood elevation lines show the locations of the expected whole-foot water-surface elevations of the base (100-year) flood. This map is developed in accordance with the latest flood insurance map preparation guidelines published by the Federal Insurance Administration.

6.0 OTHER STUDIES

The results of this study are consistent with the observations and recommendations presented in the Drainage Study, Morris County, New Jersey (Reference 4). This study has been coordinated with the Flood Insurance Study for the Township of Morris which is being prepared (Reference 11).

Approximate flood boundaries do not match the Flood Insurance Study for the Township of Hanover (Reference 13). Because this study uses more recent data in its analysis, it supersedes the Hanover study.

Flood boundary delineations for this study supersede the Federal Insurance Administration's Flood Hazard Boundary Map (Reference 14).

This study is authoritative for the purposes of the National Flood Insurance Program; data presented herein either supersede or are compatible with all previous determinations.

7.0 LOCATION OF DATA

Survey, hydrologic, hydraulic, and other pertinent data used in this study can be obtained by contacting the Insurance and Mitigation Division Federal Emergency Management Agency, 26 Federal Plaza, Room 19-100, New York, New York 10278.

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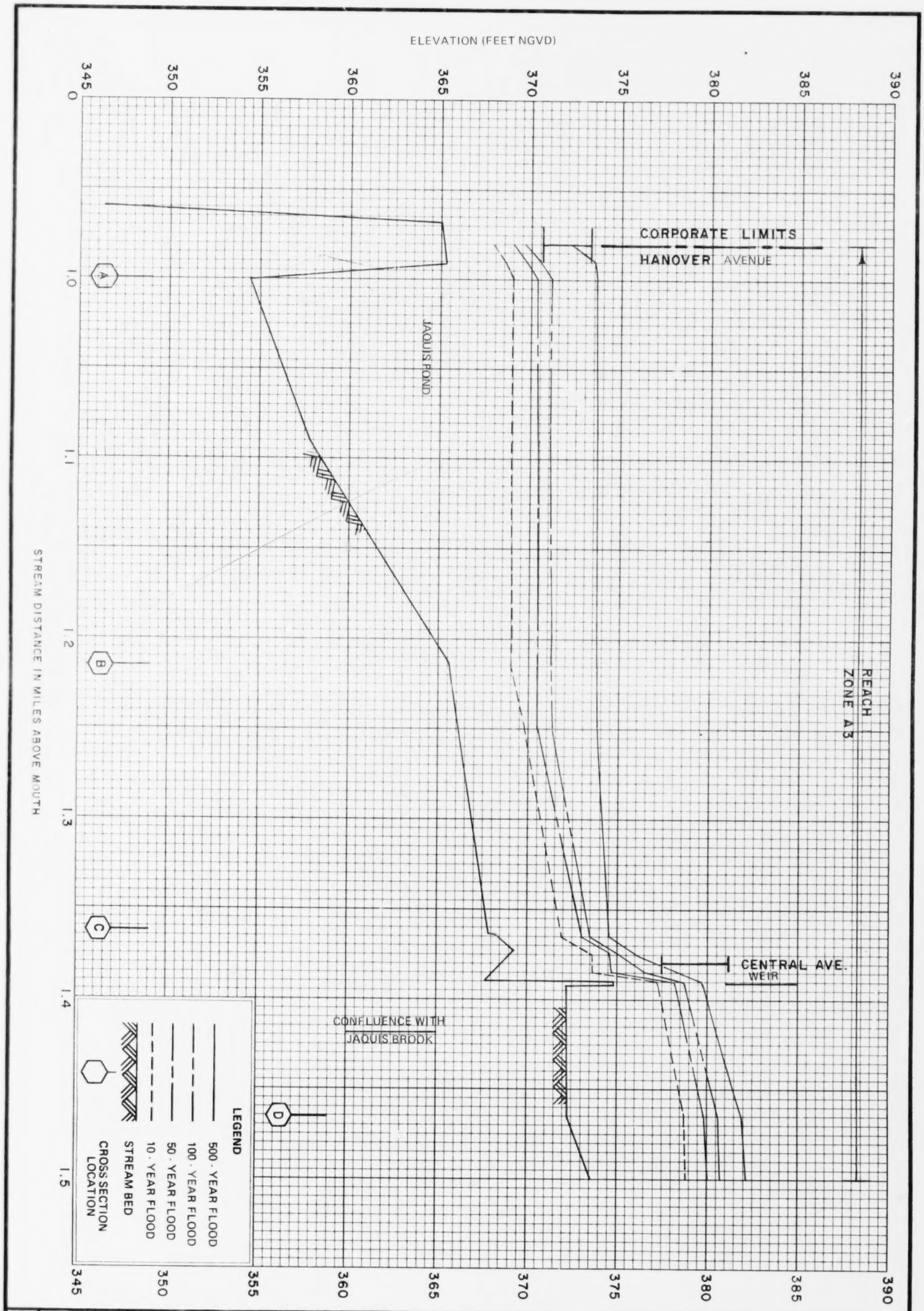

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

BOROUGH OF MORRIS PLAINS, NJ
(MORRIS COUNTY)

FLOOD PROFILES

WATNONG BROOK

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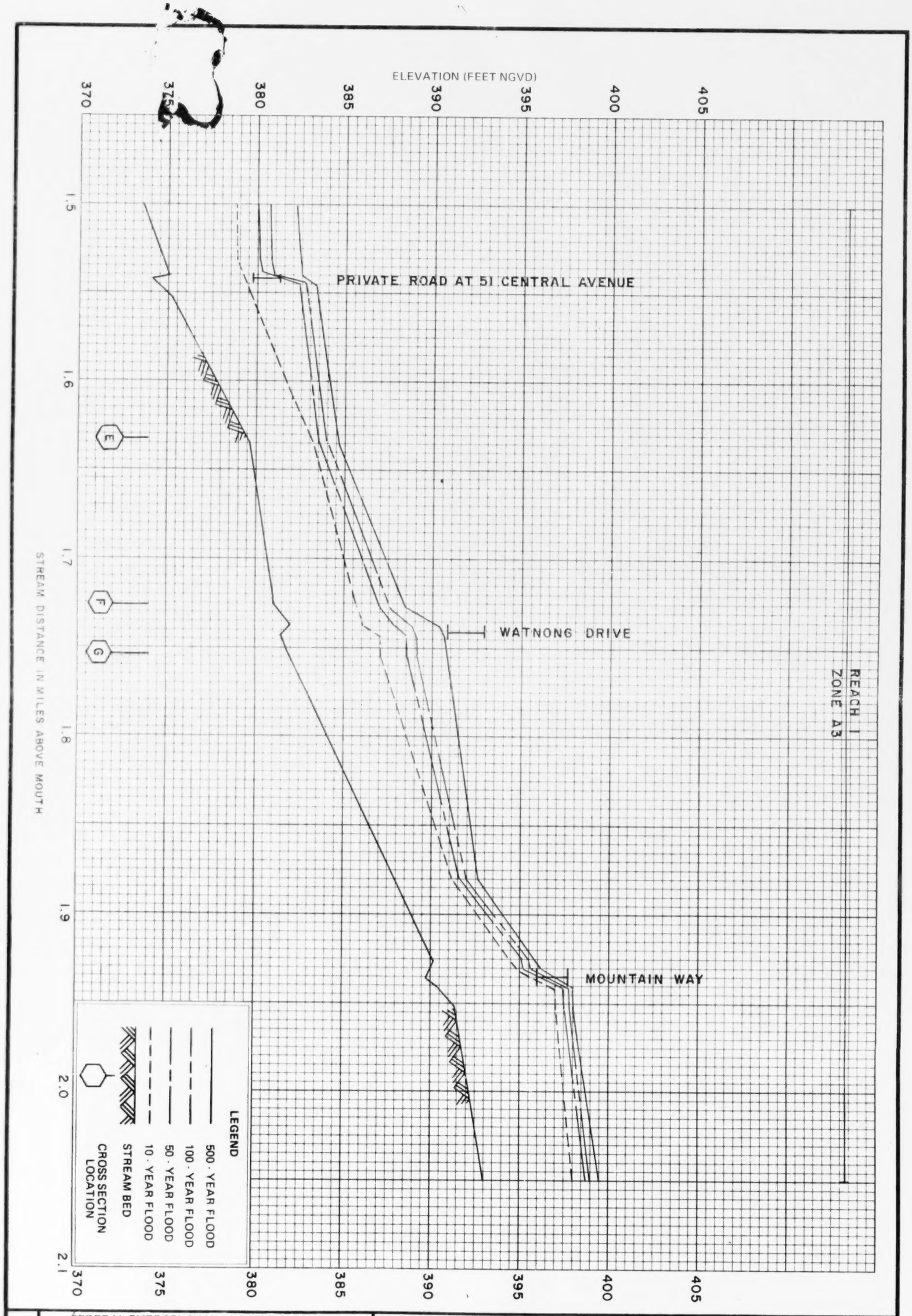

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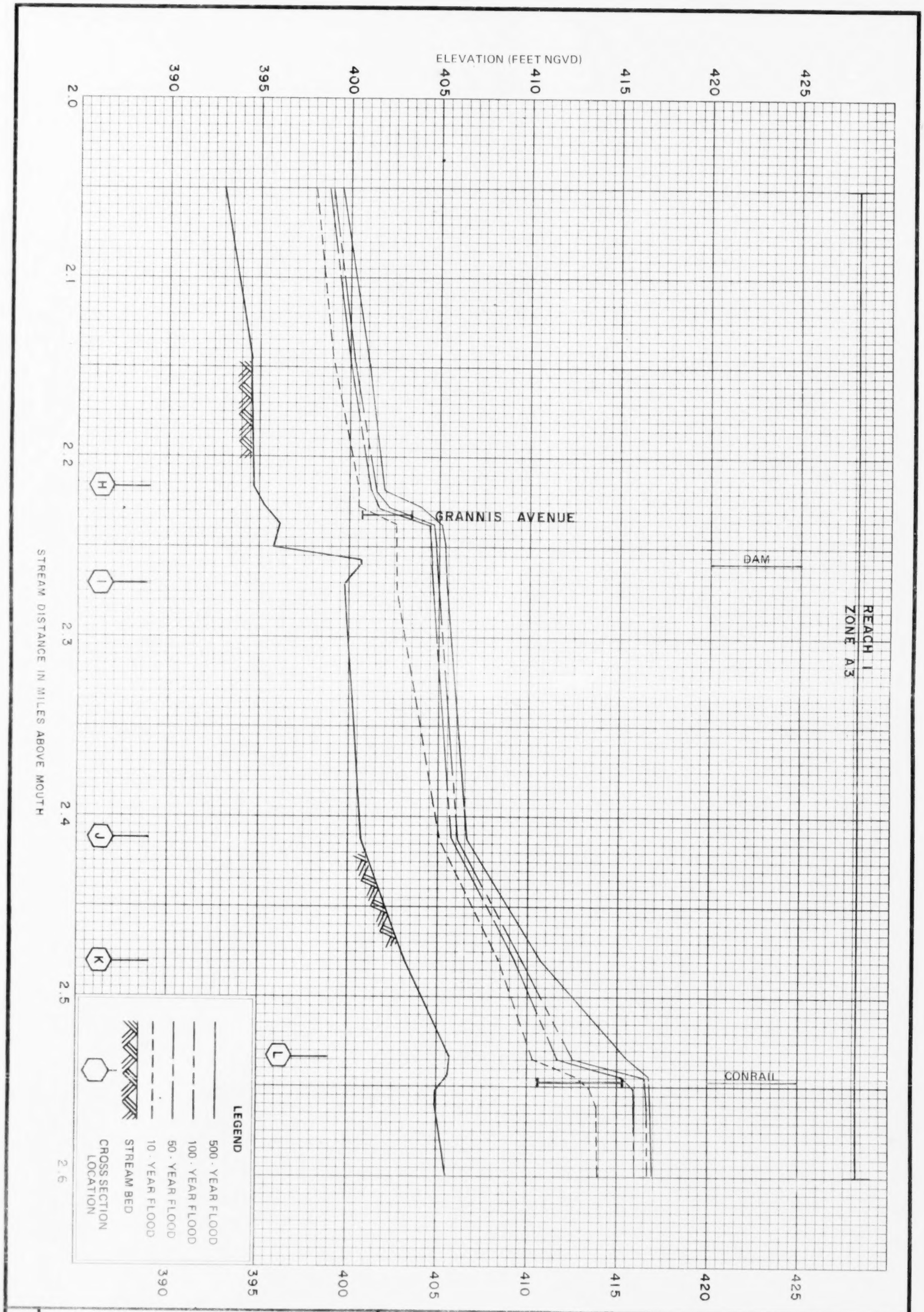
FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

BOROUGH OF MORRIS PLAINS, NJ
(MORRIS COUNTY)

FLOOD PROFILES

WATNONG BROOK



FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

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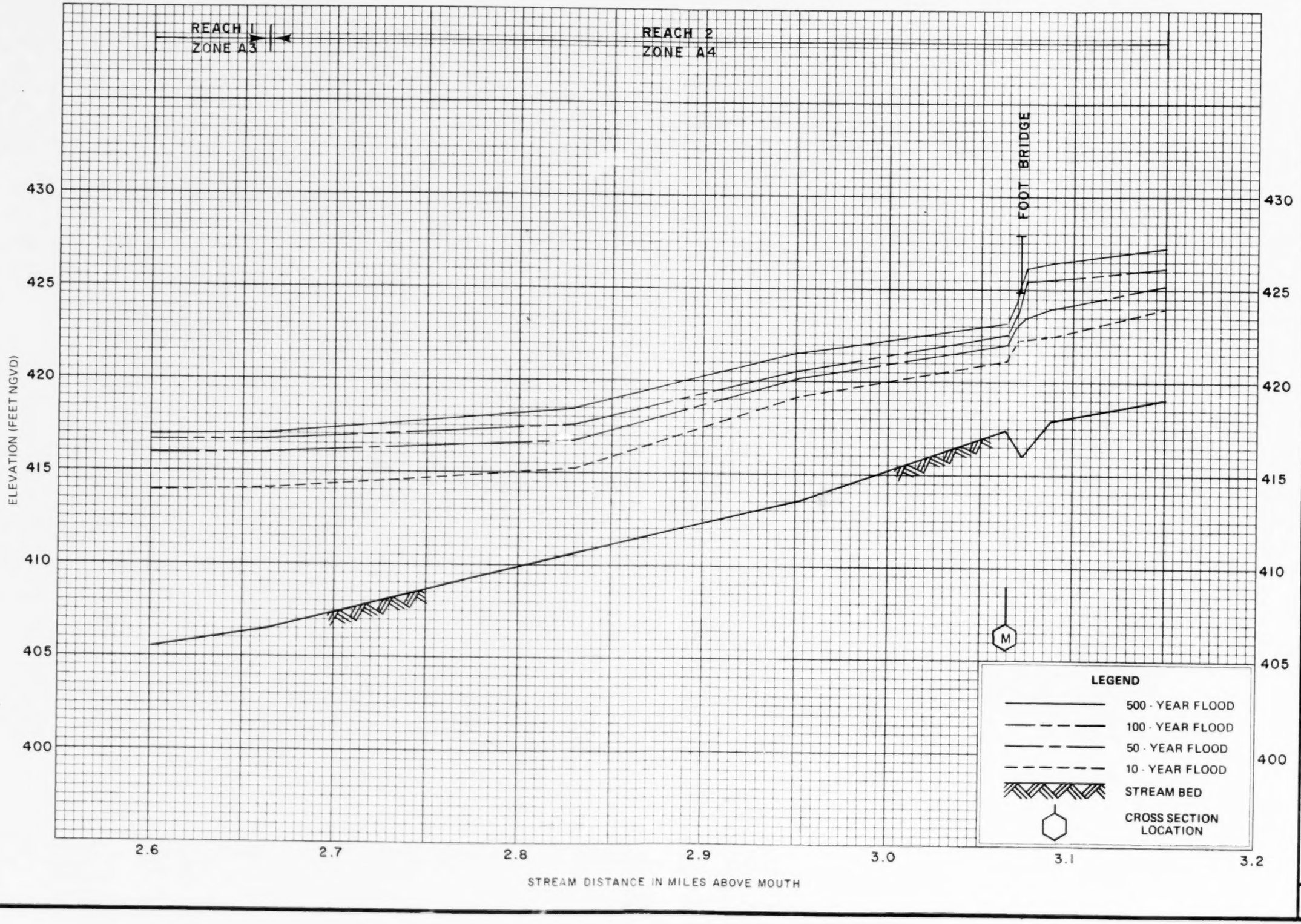
BOROUGH OF MORRIS PLAINS, NJ
(MORRIS COUNTY)

FLOOD PROFILES

WATNONG BROOK



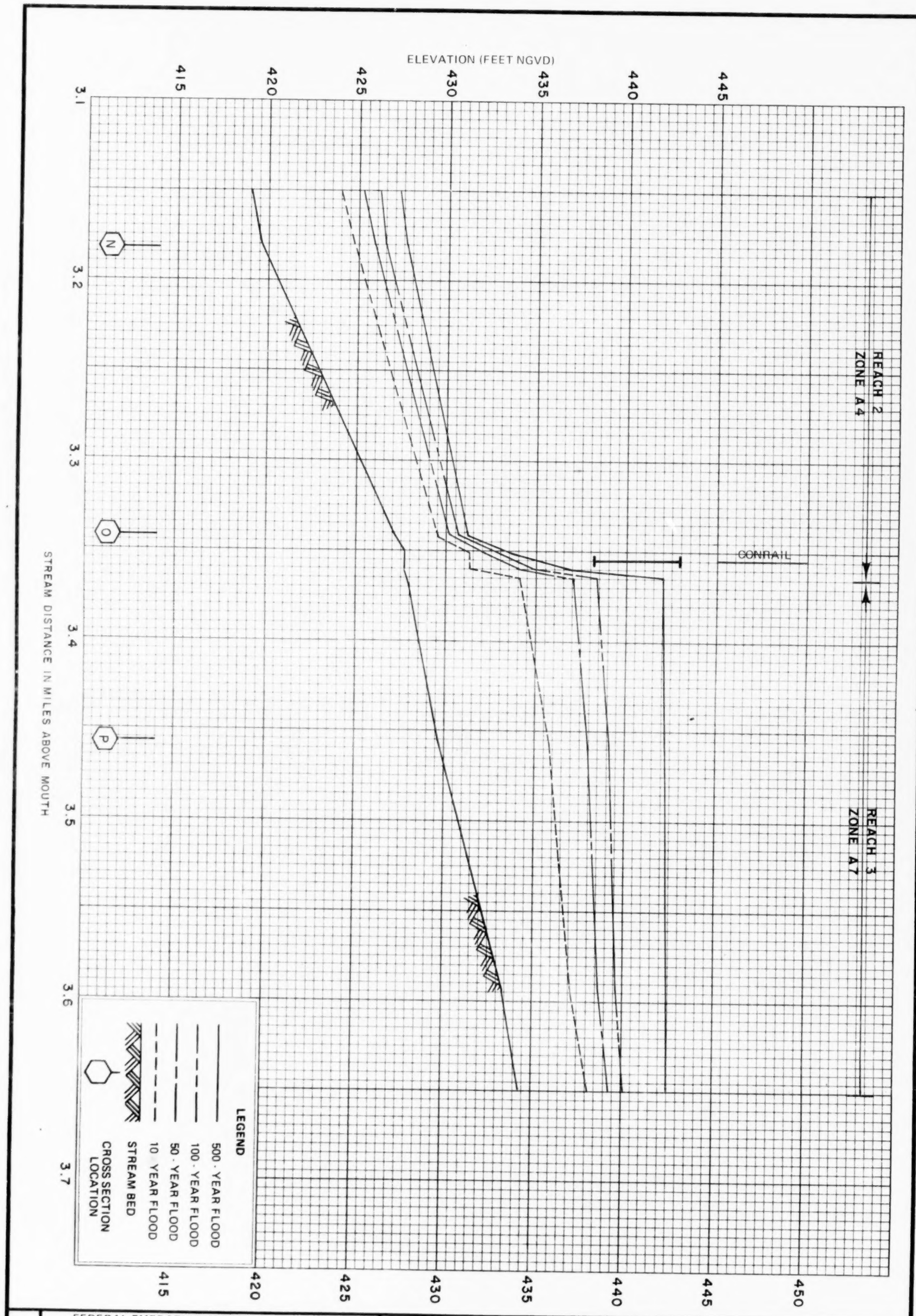
FLOOD PROFILES

WATNONG BROOK

FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

BOROUGH OF MORRIS PLAINS, NJ
(MORRIS COUNTY)

04P



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FEDERAL EMERGENCY MANAGEMENT AGENCY
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BOROUGH OF MORRIS PLAINS, NJ
(MORRIS COUNTY)

FLOOD PROFILES

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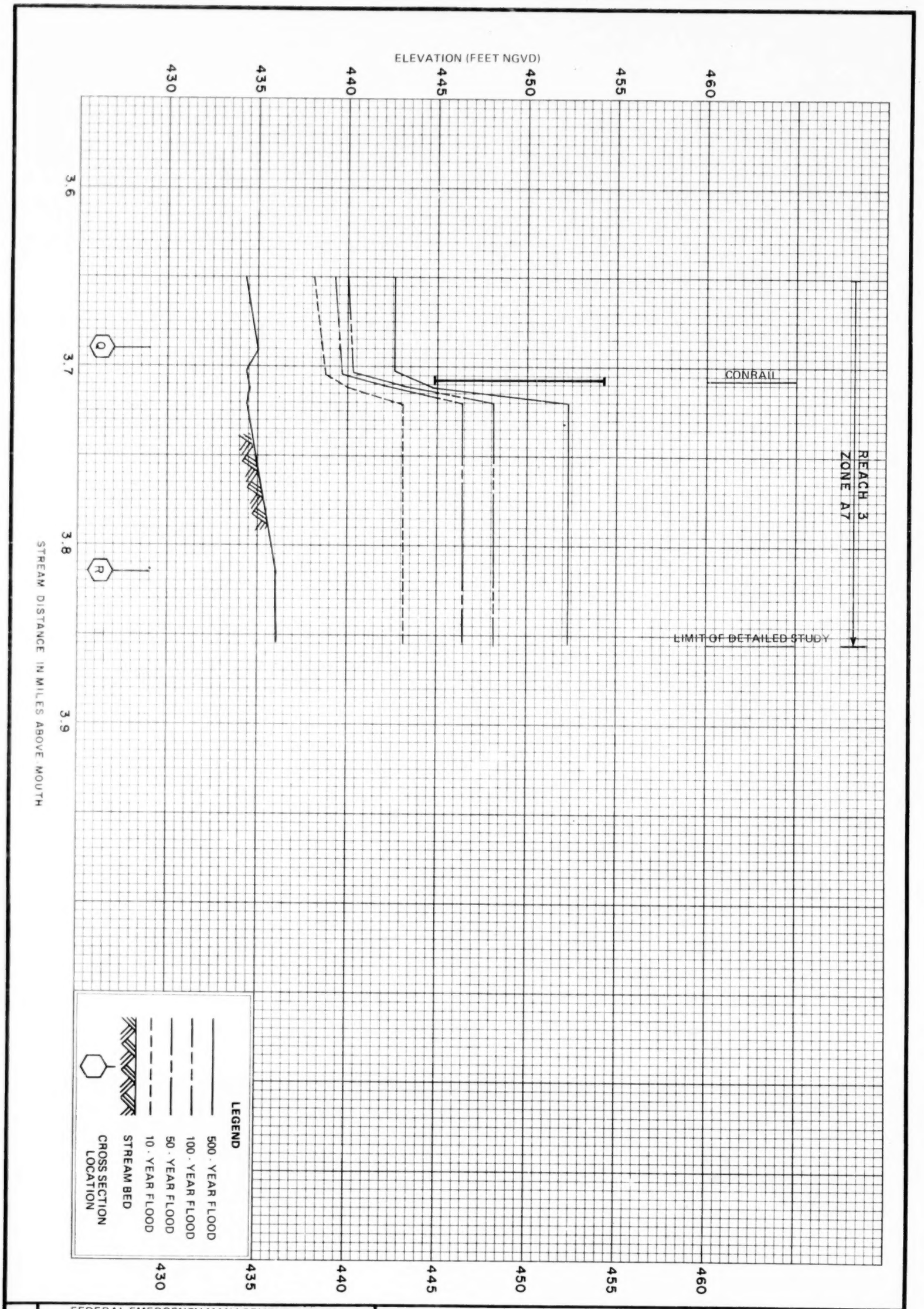


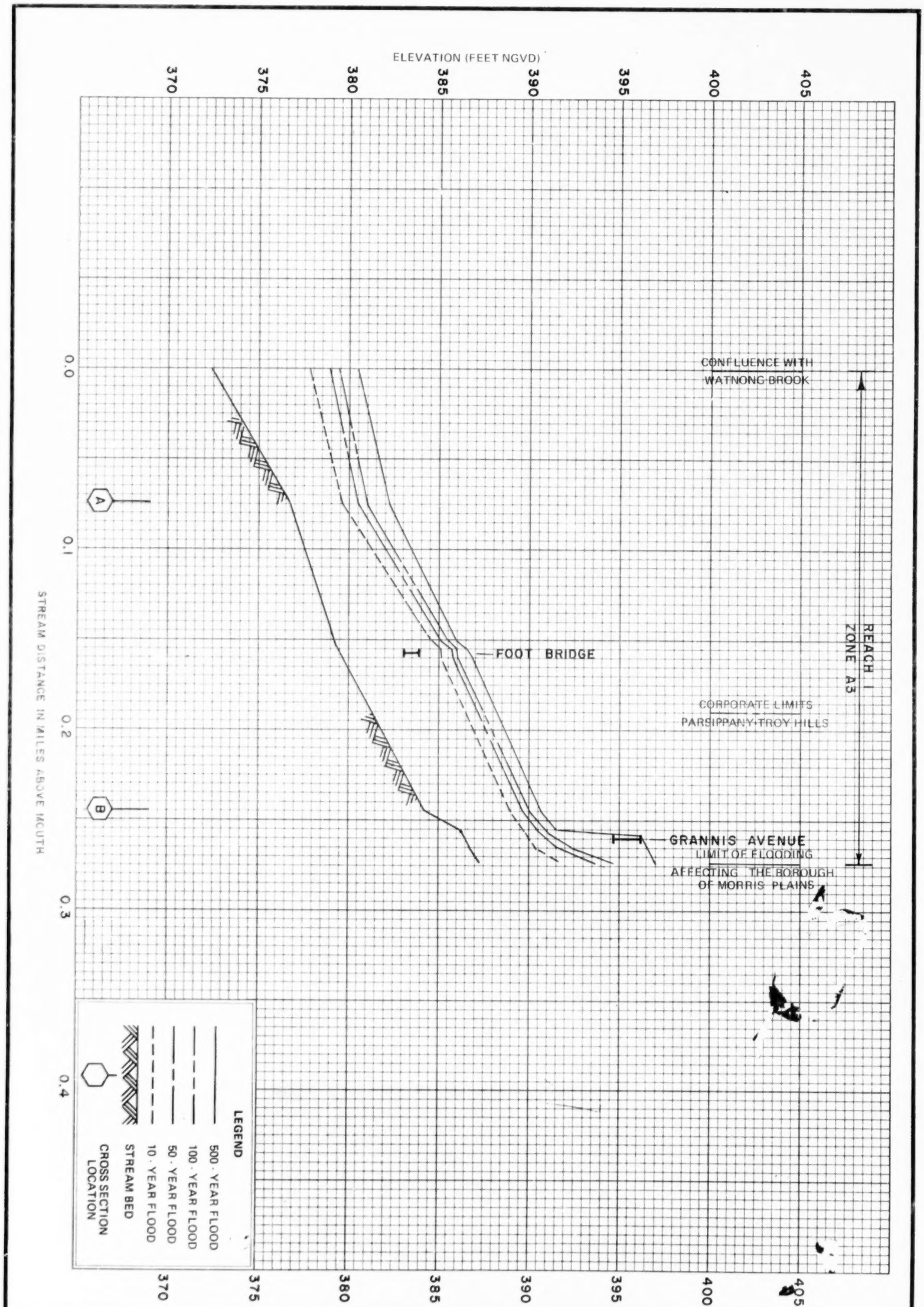
FEDERAL EMERGENCY MANAGEMENT AGENCY
Federal Insurance Administration

BOROUGH OF MORRIS PLAINS, NJ
(MORRIS COUNTY)

FLOOD PROFILES

WATNONG BROOK

06P



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(MORRIS COUNTY)

FLOOD PROFILES

JAQUIS BROOK

07P